

Emancipation Through Education

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February 15, 2012

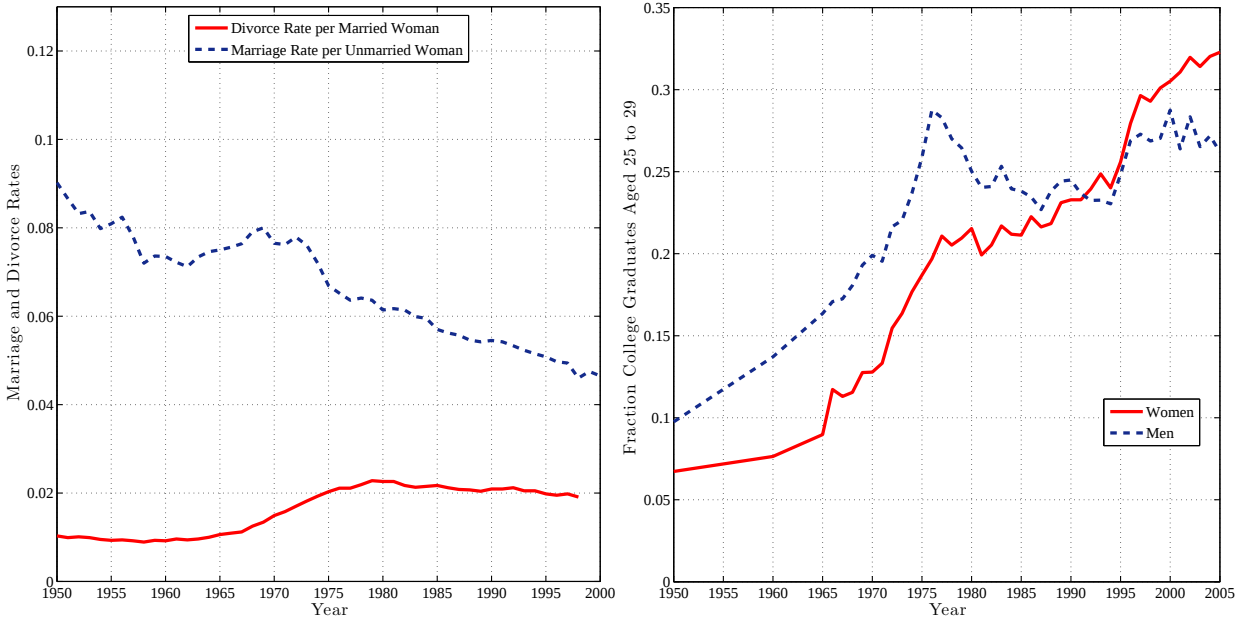
Extended Abstract

This paper investigates the effects of education on the evolution of women's role in the society—specifically, in the labor market and in the marriage market. In particular, it focuses on the following four socio-economic trends observed in the United States since the 1950s:

1. *Marriage/Divorce Rates:* The marriage rate has fallen by almost half between 1950 and 2000, whereas the divorce rate has doubled during the same time (figure 1, left panel).
2. *Educational attainment of women:* The fraction of women with a college degree rose substantially during this time. For example, during the 1950s, for every college-educated woman, there were about two college-educated men. This gap has started closing in the mid 1960s and had completely vanished by late 1980s (figure 1, right panel). Today, the gap is reversed with more women graduating from college than men.
3. *Gender wage gap:* The gender wage gap has been shrinking since the 1960s: an average female worker now earns about 80-85% of her male counterpart, whereas this ratio used to be about 60% in 1960. Although part of this trend is due to changing composition (as more women get educated compared to men, the relative wage of women is bound to rise), the gender wage gap conditional on education has also been closing.
4. *Female labor force participation:* Finally, married women started joining the labor market in droves, causing the average hours worked by this group to increase by four-fold since 1950, which far exceeds the change in any other group (married men, single women, etc).

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Figure 1: US Data: Marriage and Divorce Rates; Educational Attainment by Gender



These trends have potentially profound effects on the society and raise several interesting questions to study. This paper builds a plausible model—with education, marriage/divorce, and labor supply decisions—in which these different trends are intimately related to each other. The paper uses such a framework to explore and quantify the importance of various mechanisms discussed below. The main focus of our analysis is on the interaction of the first two trends mentioned above: the rising educational attainment of women and the changing marriage/rising divorce rates. But because these trends are intimately related—at least in our model—to the rising labor force participation of women and the gender wage gap, these will also be part of our investigation. Furthermore, divorce laws in the United States typically allow spouses to keep a much larger fraction of the returns from their human capital after divorce compared to their physical capital, making education a good insurance against divorce risk. This is a key aspect of education that we study. Although a number of studies have examined the effects of marital status on various economic outcomes—e.g., savings, wealth accumulation, assortative matching—there is little research that has focused on the feedback between marriage/divorce and education choice and attempted to understand the observed trends within this context.

Basic Framework

We begin with a description of the basic model, which will allow me to discuss the various mechanisms that will be explored. (Several extensions/variations will be explored.) Consider an economy populated with equal numbers of men and women. Individuals live for T periods

and make (i) a one-time education decision when young, (ii) dynamic marriage/divorce decisions every period, and (iii) a static time allocation decision every period.

Educational attainment and the evolution of the gender wage gap will be central in this framework, so we start by discussing how these are modeled. We assume that men and women are born with fixed amounts of “brawn” (physical skills) and “brain” (cognitive skills) and supply both skills in the labor market. Men and women have the same amount of brain but men have more brawn, which seems plausible. Individuals can attend college, which allows them to increase their cognitive abilities by a fixed amount. Education is obtained by paying a fixed cost that varies randomly across individuals: $\kappa \sim N(\mu_\kappa, \sigma_\kappa)$. An important exogenous driving force we are interested in is skill-biased technical change (SBTC), which we model as a rise in the wage of brain relative to brawn. It can be shown that, with this structure, SBTC results in a rise in female educational attainment and leads to a closing of the gender wage gap. But, on its own, it cannot generate a reversal of the education gap between men and women.

After the education decision has been made, individuals enter the economy as singles and meet a prospective spouse (who has either high or low education, with the fraction determined in equilibrium), every period until they marry. During marriage, spouses enjoy the company of each other. As such, spouses’ leisure times are perfect complements: $v(\ell_1, \ell_2) = \min(\ell_1, \ell_2)$. Spouses also derive utility from a public consumption good, which is produced by combining market goods (c) and each spouse’s home production time ($1 - n_i - \ell_i$, $i = 1, 2$, where n_i is market time). Spouses are assumed to be perfectly substitutable in home production, since we view this activity as capturing chores/tasks that either spouse can (arguably) do without the other.¹ There is a match-specific random draw, b , that affects the value of the leisure activity and evolves as an AR(1) during marriage: $b' = (1 - \rho)\mu_b + \rho b + \epsilon$, where $\epsilon \sim N(0, \sigma_b^2)$. Notice that b can be positive (marital bliss or love) or it can be negative (marital distress). In the latter case, spouses suffer from living together but may nevertheless stay married because of the income/home production benefits of marriage. To summarize, the utility of each spouse is

$$U^P(c, \ell_1, \ell_2) = \underbrace{\frac{\left(\gamma \left(\frac{c}{\phi}\right)^\alpha + (1 - \gamma) \left(\frac{(1 - n_1 - \ell_1) + (1 - n_2 - \ell_2)}{\phi}\right)^\alpha\right)^{\frac{1 - \sigma}{\alpha}}}{1 - \sigma}}_{\text{Utility from Home Production}} + b \times \underbrace{v(\ell_1, \ell_2)}_{\text{Leisure}},$$

where ϕ converts inputs into per-spouse units and can allow for economies of scale in marriage

¹This assumption also allows us to generate specialization in market work in a simple fashion: as long as there is a gender wage gap, the husband will work full time before the wife joins the labor market. While this assumption is not necessary, it is helpful for accounting for significant non-participation by married women especially in the 1950s.

(when it is smaller than 2). Analogously, the preferences of a single individual is

$$U^P(c, \ell) = \frac{(\gamma c^\alpha + (1 - \gamma)(1 - n - \ell)^\alpha)^{\frac{1-\sigma}{\alpha}}}{1 - \sigma} + v(\ell),$$

Since b evolves over the life of a marriage, it causes spouses to reevaluate every period whether or not they want to divorce. Whether divorce actually takes place or not also depends on the legal system. Under “consent divorce” laws, a divorce request is granted only when both agents prefer to separate (or one spouse is shown to be at fault, such as, committing infidelity). Under this regime, if only one spouse wants divorce, he/she will be “trapped” in the marriage. While divorce laws vary across US states, consent divorce was the predominant legal framework before the 1970s.² An alternative—which has become the dominant framework since the late 1970s—is the “unilateral divorce” regime, which requires only one spouse to request a divorce (without requiring proof of fault) for it to be granted.³ In the model, the only cost of divorce is that divorcees must remain single for a certain (exogenously given) period of time.

Mechanisms.

This basic framework generates several interesting feedbacks between the education choice and marriage/divorce decisions. One mechanism that we are particularly interested in is the following. Suppose that in the 1950s, women come to expect that the divorce rate will rise in the future.⁴ Since education provides insurance against divorce (in the form of higher income), this expectation will increase the demand for education for young women in 1950s. (Although these effects are similar for men, they are not symmetric because of initial conditions. US males in 1950 had both higher education and higher wages conditional on education than women.) But higher income in turn *reduces* an important benefit of marriage for women, by closing the income gap between the spouses, which then—now endogenously—raises the divorce rate. This happens because, some women who previously did not agree to divorce (despite a low value of b) are now willing to divorce and stay single since they are able to support themselves with their higher income. Thus, the higher education of women

²? relates some interesting historical evidence, such as trapped spouses hiring firms that specialize in (illegally) concocting evidence about unwilling spouses’ infidelity. These desperate measures indicate potentially large welfare losses suffered by trapped spouses.

³? is an authoritative source on the evolution of divorce laws in the 20th century United States and contains a careful state-by-state analysis of the causes and consequences of these changes.

⁴This can be due to, for example, an anticipation of the move from consent to unilateral divorce regime, an expected fall in fertility (which makes divorce less costly), a rise in female educational attainment (which makes women financially more independent), and so on. The precise reason for such an expectation is not crucial at this point. We are interested in certain amplification channels that will be active within this framework.

which was supposed to insure against divorce risk, itself creates more divorce, which in turn generates more demand for education by women. Consequently, a small exogenous rise in divorce risk can result in a larger rise in actual divorce rates as well as in women’s educational attainment in equilibrium due to this amplification mechanism.⁵

The interaction of education and the marriage market also creates an externality effect: when there are more educated men than women, some educated men are likely to marry uneducated women (rather than remain single), which lowers the returns on education for women. However, as more women get educated, it becomes more difficult for an uneducated woman to attract an educated man, which increases the education demand of all women. Thus, the returns to education can easily be *increasing* in the supply of educated women, which fuels demand for education.

It is also interesting to see what happens with an exogenous change from consent to unilateral divorce law in this model. Let $\underline{b}_i, i = 1, 2$ be the lower bound on b for marriage to be optimal for i . Consent divorce law requires $b < \min(\underline{b}_1, \underline{b}_2)$, whereas unilateral divorce requires only $b < \max(\underline{b}_1, \underline{b}_2)$, which implies that the divorce rate will rise quickly after the change in the law (from consent to unilateral), consistent with what has been observed in the US data during the 1970s. However, because the new marriages formed under the unilateral law will involve better selection the rise in the divorce rate is followed with a subsequent but smaller decline.

Key Experiments.

Table 1 presents some implications obtained from a preliminary calibration.⁶ The exogenous changes over time are SBTC from 1950 to 2000 and a move to unilateral divorce law. While some of the magnitudes are clearly off, the general patterns generated by the model are consistent with the data, which we find encouraging. In particular, the change in the divorce law in the 1970s toward a unilateral divorce regime leads to an initial strong rise in the divorce rate and a subsequent small fall—the same pattern as in the data. Similarly, the marriage rate falls faster between 1960 and 1980 and then continues its fall albeit at a slower

⁵As can be anticipated from this discussion, this framework is open to the possibility of multiple equilibria, although this is nothing new in search models of the marriage market. While this did not appear to be a problem so far (based partly on the parameter choices we have experimented with), this issue still requires a lot of caution.

⁶Essentially, we assume that the model was in steady state before 1940 and set the parameters as follows. First, we set $\alpha = 0.45$ from ?, and $\sigma = 1.5$. In addition, we chose the utility weights on consumption and leisure (γ, ζ) to match market hours worked for married men and women in 1940; the mean, variance and persistence of the love shock (μ_b, σ_b^2, ρ) to match (i) the marriage rate in 1940, (ii) the divorce rate in 1940, and (iii) the probability that a marriage formed in 1940 survives until 15th anniversary. Furthermore, we choose the rise in the price of brain relative to brawn from 1950 to 2000 to match the fraction of educated men in 2005. Individuals have perfect foresight.

Table 1: Some Key Socio-Economic Variables, 1950-2000: US Data vs Model

	1960	1980	2000	
Marriages per 1000 unmarried women				
US Data	6.8	5.3	4.2	
Model	5.1	4.2	4.0	
Divorces per 1000 married women				
US Data	0.9	2.4	1.9	
Model	1.1	4.6	3.8	
College Graduates per 100 (Men/Women)				
US Data	14/7	25/21	27/31	
Model	13/10	20/19	27/29	
Change in Labor Supply: 1950-2000 (Hours/2000)				
	Married		Single	
	Men	Women	Men	Women
US Data	0.06	0.42	0.14	0.16
Model	0.00	0.51	0.11	0.12

pace. As for education, the model generates the empirical fact that women overtake men as the gender with more college attainment from 1960 to 2000. Finally, the model is consistent with the large rise in the labor supply of married women and the relative stability for married men.

So far, we have explored this framework with alternative calibrations and assumptions. We will also consider relaxing perfect foresight and allowing for Bayesian learning under different initial priors (as proposed and implemented by ? for transition experiments).

Another key assumption in the preceding discussion is the exogeneity of the change in the divorce law. While this assumption is common in the literature, it is hard to imagine why so many states would change their divorce laws “exogenously” in a 10-year period, nearly all in the same direction. We will investigate if these legal changes can be viewed as an optimal outcome in a model where a social planner chooses between different divorce regimes every period. It is possible that the socio-economic trends since the 1950s could have made unilateral divorce laws optimal (by reducing the benefit of consent laws—which were designed to protect the “weaker” spouse—and increasing the welfare losses arising from trapped spouses). It would be interesting to bring this model to the data and see if it is consistent with the timing and direction of change in divorce laws.

A final step in this paper will be to model the evolution of the stigma associated with divorce over time—as an endogenous phenomenon. To this end, suppose that, instead of a

match-specific b , each individual has some inherent quality as a spouse, which is revealed *only* to the other spouse during marriage (and enters the other spouse's utility). Since quality is not publicly observable, a divorce sends a negative signal to the market about both spouses, leading the pool of divorcees to be less desirable than singles, which we view as the “stigma” of divorce. This stigma will create another friction, which keeps some high-quality individuals from divorcing, again being trapped in a bad marriage. However, if the divorce rate were to rise for some exogenous reasons (such as SBTC assumed above), then the informativeness of divorce as a signal will diminish, encouraging individuals to divorce more easily, eroding the stigma of divorce. Thus, even a smaller exogenous force could be sufficient to induce large changes in the marriage market. As can be anticipated, this model is quite a bit more complex than the basic one outlined above. But, these considerations do seem relevant and we intend to explore versions of this expanded framework to provide a better understanding of the dynamics of marriage and divorce.

References